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# Ambient Water Quality Criteria Document Addendum for Chlorinated Naphthalenes

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AMBIENT WATER QUALITY CRITERIA DOCUMENT
ADDENDUM FOR CHLORINATED NAPHTHALENES

## Prepared for

OFFICE OF WATER REGULATIONS
AND STANDARDS

## Prepared by

Environmental Criteria and Assessment Office
Office of Health and Environmental Assessment
U.S. Environmental Protection Agency
Cincinnati, OH 45268

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Under the 1977 Clean Water Act, Congress mandated the U.S. Environmental Protection Agency to develop ambient water quality criteria for 129 priority Pollutants. These criteria were published in 1980. Under Section 304(a)(1) of the Clean Water Act as amended in 1987, the U.S. EPA is mandated to re-evaluate and update these criteria every five jears. These addenda represent an updated literature search current as of 1988, plus additional information from Agency files and Program Offices. This addendum is to update the existing Ambient Water Quality Criteria Document for Chlorinated Naphthalenes.

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## PREFACE

Under the 1977 Clean Water Act, Congress mandated the U.S. Environmental Protection Agency to develop ambient water quality criteria for 129 priority pollutants. These criteria were published in 1980. Under Section 304(a)(1) of the Clean Water Act as amended in 1987, the U.S. EPA is mandated to re-evaluate and update these criteria every five years. These addenda represent an updated literature search current as of 1988, plus additional information from Agency files and Program Offices. The first draft of this addendum was prepared by Syracuse Research Corporation under contract no. 68-C8-0004.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| PEL | Permissible exposure limits |
| CRAVE | Carcinogen Risk Assessment Verification Endeavor |
| ppm | Parts per million |
| RfD | Reference dose |
| TLV | Threshold limit value |
| TWA | Time-weighted average |

# INTRODUCTION

Under Section 304(a)(1) of the Clean Water Act of 1977 as amended in 1987, the U.S. EPA is required to publish criteria for water quality accurately reflecting the latest scientific knowledge regarding the effects on health and welfare that may occur from the presence of pollutants in any body of water, including groundwater. In accordance with the 1977 act, Ambient Water Quality Criteria Documents (AWQCDs) were developed in 1980 for 65 toxic pollutants or classes of pollutants listed under Section 307(a)(1).

These addenda are intended to serve as an update of the original AWQCDs. The addenda provide the Agency with the latest scientific assessments of potential health hazards associated with these pollutants and serve as guidelines for modifying the current (1980) AWQCDs.

The human health criteria in these addenda are based on Agency verified risk assessment values when available. These values consist of reference doses (RfD) for those chemicals believed to be systemic toxicants (i.e., do not induce cancer) and cancer risk factors for those thought likely to cause cancer in humans. The verification process consists of a review and consensus of risk assessment values provided by an Agency workgroup consisting of scientists from each of the major Agency offices. Assessments for noncarcinogens are verified by the RfD workgroup and those for carcinogens are verified by the Carcinogen Risk Assessment Verification Endeavor (CRAVE) workgroup. If such values are not available, the criteria are based on the most recent Agency health assessment. In the absence of any appropriate Agency value, RfD values or cancer risk factors are derived by current Agency methods if adequate new data are available, and criteria are recommended based on the proposed RfD or risk factor.

The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD is derived by dividing a NOAEL or LOAEL for subchronic or chronic exposure by standard uncertainty factor(s) times an additional uncertainty factor:

$$RfD = \frac{\text{NOAEL or LOAEL}}{UF(s) \times UF}$$

The standard uncertainty factors are applied to reflect the various types of data used to estimate RfDs. An uncertainty factor of 10 is used to account for variations in human sensitivity when extrapolating from valid human studies involving long-term exposure of average, healthy subjects. An additional 10-fold factor is used for each of the following: to extrapolate from long-term animal studies to the case of humans, to extrapolate from subchronic animal studies to chronic exposure, and to extrapolate from a LOAEL to a NOAEL. An additional uncertainty factor of >0-10 may be applied to reflect professional assessment of the uncertainties of the study and data base not explicitly addressed by the standard uncertainty factors (i.e., completeness of the overall data base). The default value for the additional uncertainty factor is 1.

In assessing the carcinogenic potential of a chemical, the U.S. EPA classifies the chemical into one of the following groups according to the degree of evidence in epidemiological studies and animal studies: Group A - Human Carcinogen; Group B - Probable Human Carcinogen [limited evidence in humans with or without sufficient evidence in animals (Group B1) or inadequate evidence in humans with sufficient evidence in animals (Group B2)]; Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals in the absence of human data); Group D - Not Classifiable as to

Human Carcinogenicity (inadequate or no evidence); Group E - Evidence of Noncarcinogenicity for Humans. Quantitative carcinogenic risk assessments are performed for chemicals in Groups A and B, and on a case-by-case basis for chemicals in Group C. Upper-bound cancer unit risks (slope values) are estimated through the use of mathematical extrapolation models. Most commonly for animal data, the linearized multistage model with a 95% upper confidence limit is used to provide a low-dose estimate of cancer risk. The cancer risk is characterized as an upper-limit estimate (i.e., the true risk to humans, while not identifiable, is not likely to exceed the upper-limit estimate and in fact may be lower). Alternative risk models to the multi-stage model, such as the one-hit, Weibull, Logit or Probit model, are available and may be used when the evidence indicates that they may be more appropriate. In the absence of such evidence, the Agency recommends the linearized multistage model to provide consistency of approach and an upper-bound on the potential carcinogenic risk. In the case where human data are used for quantitative risk assessment, an upper-bound estimate rather than a 95% upper-bound estimate is used when low-dose linearity is assumed.

In the development of this Addendum to the AWQCD on chlorinated naphthalenes, recent Agency assessments have been consulted. A computerized literature search was conducted to cover studies published more recently than the latest Agency assessment (i.e., published in 1980 to 1988). New key studies have been evaluated.

## REVIEW OF NEW DATA

### Toxicologic/Carcinogenic Effects

Relevant toxicity studies have not been reported in the literature since the publication of the original AWQCD document (U.S. EPA, 1980). Teratogenic, mutagenic or carcnogenic properties of the chemicals remain undefined. Chlorinated naphthalenes lack appropriate chronic or subchronic toxicity data to define an RfD or carcinogenic potency factor for individual congeners or for the chemical class.

However, NIOSH is currently conducting an epidemiologic study regarding mortality of workers exposed to Halowax (chlorinated naphthalene). The purpose of the study is to assess the association between Halowax exposure and the risk of developing cancer.

Intraperitioneal injection of young male Wistar rats with chlorinated naphthalene congeners indicates that these chemicals can induce hepatic mixed-function oxidases. The greatest induction of aryl hydrocarbon hydroxylase was generally caused by those congeners that are isostereomers of 2,3,7,8-TCDD, having full lateral chlorination (Campbell et al., 1983). This inductive effect may underlie the synergistic actions involving a penta-/hexachloronaphthalene mixture and alcohol/carbon tetrachloride as described previously (U.S. EPA, 1980).

### Bioconcentration Factor (BCF)

Pertinent new information concerning the bioconcentration factor for chlorinated naphthalenes is currently undergoing Agency review. When this review has been completed, the new information will be incorporated into this document.

## QUANTIFICATION OF EFFECTS

No adequate subchronic or chronic toxicity tests or carcinogenicity studies have been performed, which would allow derivation of ambient water quality criteria for any chlorinated naphthalene. While various studies have revealed a variety of toxic aspects such as hepatic toxicity and chloracne, these studies were not designed to determine dose-response relationships. Quantification of health effects of this class of chemicals is not feasible until more comprehensive data become available.

## EXISTING STANDARDS AND CRITERIA

The OSHA 8-hour TWA PELs for occupational exposure to tri-, tetra-, penta-, hexa- and octachloronaphthalene are 5, 2, 0.5, 0.2 and 0.1 mg/m$^3$, respectively (OSHA, 1985), and are identical to the corresponding ACGIH 8-hour TWA-TLVs (ACGIH, 1987).

Because of the absence of long-term animal cancer bioassay and human data, chlorinated naphthalene would be classified as a U.S. EPA Group D compound (i.e., not classifiable as to human carcinogenicity).

## REFERENCES

ACGIH (American Conference of Governmental Industrial Hygienists). 1987. TLVs - Threshold Limit Values and Biological Exposure Indices for 1987-1988. Cincinnati, OH. p. 22, 28, 29, 34, 35.

Campbell, M.A., S. Bandiera, L. Robertson, A. Parkinson and S. Safe. 1983. Hepta-, hexa-, tetra- and dichloronaphthalene congeners as inducers of hepatic microsomal drug-metabolizing enzymes. Toxicology. 26: 193-205.

NTIS (National Technical Information Service). 1988. Federal Research in Progress. Online database.

OSHA (Occupational Safety and Health Administration). 1985. Occupational Standards and Permissible Exposure Limits. 29 CFR 1910.1000.

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